

$$\sqrt{x^2} = |x| \quad \sqrt[3]{x^3} = x$$

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Simplifying Radicals

Simplify. Use absolute value ~~signs~~ ^{symbol} when necessary.

$$1) \sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = 2\sqrt{6}$$

$$2) \sqrt[3]{1000} = 10$$

$$3) \sqrt[3]{-162} = \sqrt[3]{-27 \cdot 6} = \sqrt[3]{-27} \cdot \sqrt[3]{6} = -3\sqrt[3]{6}$$

$$4) \sqrt{512} = \sqrt{256 \cdot 2} = \sqrt{256} \cdot \sqrt{2} = 16\sqrt{2}$$

$$5) \sqrt[4]{128n^8} = \sqrt[4]{16 \cdot 8 n^8} = \sqrt[4]{16 n^8} \cdot \sqrt[4]{8} = 2n^2 \sqrt[4]{8}$$

$$6) \sqrt{98k} = \sqrt{49 \cdot 2k} = 7\sqrt{2k}$$

$$7) \sqrt[5]{224r^7} = \sqrt[5]{32 \cdot 7 r^7} = \sqrt[5]{32 \cdot 7 \cdot r^5 \cdot r^2} = 2r \sqrt[5]{7r^2}$$

$$8) \sqrt[3]{24m^3} = \sqrt[3]{8 \cdot 3 m^3} = 2m \sqrt[3]{3}$$

$$9) \sqrt{392x^2} = \sqrt{196 \cdot 2 x^2} = 14|x| \sqrt{2}$$

$$10) \sqrt{512x^2} = \sqrt{256 \cdot 2 x^2} = 16|x| \sqrt{2}$$

$$11) \sqrt[4]{405x^3y^2} = \sqrt[4]{81 \cdot 5 x^3 y^2} = 3\sqrt[4]{5x^3y^2}$$

$$12) \sqrt[3]{-16a^3b^8} = \sqrt[3]{-8 \cdot 2 a^3 b^6 \cdot b^2} = -2ab^2 \sqrt[3]{2b^2}$$

$$13) \sqrt[4]{128x^4y^7} = \sqrt[4]{16 \cdot 8 x^4 y^4 y^3} = 2|x|y \sqrt[4]{8x^3y^3}$$

$$14) \sqrt[3]{16xy} = \sqrt[3]{8 \cdot 2 xy} = 2\sqrt[3]{2xy}$$

$$15) \sqrt[6]{448x^7y^7} = \sqrt[6]{64 \cdot 7 x^6 y^6 y} = 2|x|y \sqrt[6]{7xy}$$

$$16) \sqrt[3]{56x^5y} = \sqrt[3]{8 \cdot 7 x^3 x^2 y} = 2x \sqrt[3]{7x^2y}$$

Critical thinking questions:

17) What simplifies into $2mn^2 \sqrt[3]{5mn^2}$?

$$\sqrt[3]{8 \cdot m^3 \cdot n^6} \sqrt[3]{5mn^2} = \sqrt[3]{40m^4n^8}$$

18) Simplify $\sqrt[n]{3 \cdot 2^n \cdot x^{2n} \cdot y^{n+3}}$
use absolute value
bars around y if
n is even

$$= \sqrt[n]{3 \cdot 2^n \cdot x^{2n} \cdot y^n \cdot y^3} = 2x^2y \sqrt[n]{3y^3}$$